

WHAT IS CLAIMED IS:

- Sub. a' > ①. A user interface apparatus comprising:  
a first sensor attached to a first portion of a  
body of a user;  
5 a second sensor attached to a second portion  
different from the first portion;  
means for generating action information of the  
second portion on the basis of a relative position of  
the second portion with respect to the first portion,  
10 which is detected by said first and second sensors; and  
determination means for determining a user  
instruction corresponding to the generated action  
information.
2. The apparatus according to claim 1, wherein the  
15 first portion is a head.
3. The apparatus according to claim 1, wherein the  
second portion is a hand.
4. The apparatus according to claim 1, wherein said  
first sensor detects a location/posture of the first  
20 portion.
5. The apparatus according to claim 1, wherein said  
second sensor detects a location and posture of the  
second portion.
6. The apparatus according to claim 1, wherein the  
25 action information includes information which pertains  
to a state change of the second portion with respect to

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a location of the first portion, and information which pertains to a location change velocity of the state change.

7. The apparatus according to claim 1, wherein the action information includes information which pertains to a state change of the second portion with respect to a location or location/posture of the first portion, and information which pertains to a location change acceleration of the state change.
- 5 8. The apparatus according to claim 1, wherein the action information includes information which pertains to a posture of the second portion with respect to a posture of the first portion.
- 10 9. The apparatus according to claim 1, wherein the action information includes information which pertains to a moving direction of a location of the second portion with respect to a posture of the first portion.
- 15 10. The apparatus according to claim 1, further comprising:
  - 20 means for storing a value of the relative position of the second portion with respect to the first portion, and a plurality of state values which are defined in advance as a result of transition of the value; and

- means for storing a plurality of different user instruction values corresponding to the plurality of state values.
11. The apparatus according to claim 1, wherein said determination means decomposes the determined user instruction into a plurality of instruction operands, and outputs the operands.
12. The apparatus according to claim 1, wherein when said generation means determines that a relative relationship between a location/posture of a head detected by said first sensor, and a location/posture of a hand detected by said second sensor indicates an action of the user whose line of sight is pointing to a predetermined portion of the hand,
- 15       said determination means outputs a user instruction for outputting an operation guidance.
13. The apparatus according to claim 1, further comprising a third sensor for detecting a bent angle of a finger.
- 20 ⑭ A game apparatus comprising:  
      a first sensor for detecting a location/posture of a head of a player;  
      a second sensor for detecting a location/posture of a hand or arm;
- 25       means for estimating an action of the player on the basis of a relative location/posture of the hand or

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arm with respect to the location/posture of the head, which are detected by said first and second sensors; and

means for outputting a player command  
5 corresponding to the estimated action.

15. The apparatus according to claim 14, further comprising display means for displaying an image of a game scene in front of the head of the player for the player.

10 16. The apparatus according to claim 14, wherein said display means is a head-mounted display.

17. The apparatus according to claim 14, wherein three steps including preparation, execution, and return steps, are prepared for the player command, and  
15 the steps are respectively defined as:

a preparation action step for the player command when the location of the hand of the player moves to a position behind a position in front of a face of the player;

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20 an execution step for the player command when the location of the hand of the player moves forward from a rear position after the preparation action; and

a return action step for the player command when the location of the hand of the player returns to a 25 position of the face of the player after the forward movement.

18. A user interface method for outputting a user instruction to a predetermined apparatus or program, comprising:
- the step of detecting a location of a first portion of a body of a user and a location of a second portion different from the first portion using first and second sensors attached to the user; and
- the step of determining a user instruction on the basis of a relative position of the second portion with respect to the first portion, which are detected by said first and second sensors, and outputting the determined user instruction to the apparatus or program.
19. The method according to claim 18, wherein said first and second sensors respectively detect locations/postures of the first and second portions.
20. The method according to claim 18, wherein the first portion is a head of the user, and the second portion is a hand of the user.
21. The method according to claim 18, further comprising the step of detecting information which pertains to a state change of the second portion with respect to a location or a location/posture of the first portion, and information which pertains to a location change velocity of the state change.
22. The method according to claim 18, further comprising the step of detecting information which

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pertains to a state change of the second portion with respect to a location or a location/posture of the first portion, and information which pertains to a location change acceleration of the state change.

5 23. The method according to claim 18, further comprising the step of detecting a posture of the second portion with respect to a posture of the first portion.

10 24. The method according to claim 18, further comprising the step of detecting a moving direction of a location of the second portion with respect to a posture of the first portion.

15 25. The method according to claim 18, further comprising the step of storing a value of the relative position of the second portion with respect to the first portion, and a plurality of user instructions which are defined in advance as a result of transition of the value.

20 26. The method according to claim 18, wherein the output step includes the step of decomposing the determined user instruction into a plurality of instruction operands, and outputting the operands.

25 27. The method according to claim 18, wherein when it is determined that a relative relationship between a location/posture of a head detected by said first sensor, and a location/posture of a hand detected by

said second sensor indicates an action of the user whose line of sight is pointing to a predetermined portion of the hand,

the output step includes the step of outputting a  
5 user instruction for outputting an operation guidance.

28. The method according to claim 19, further comprising the step of detecting a bent angle of a finger from a third sensor.

29. A computer readable storage medium, which stores  
10 a program of a user interface method for outputting a user instruction to a predetermined apparatus or program, storing:

a program step of detecting a location of a first portion of a body of a user and a location of a second portion different from the first portion using first and second sensors attached to the user; and

a program step of determining a user instruction on the basis of a relative position of the second portion with respect to the first portion, which are  
20 detected by said first and second sensors, and outputting the determined user instruction to the apparatus or program.

30. A game apparatus for displaying a CG image in front of a field of view of a player, comprising:

25 a first sensor for detecting a location of a first portion of a body of the player;

- a second sensor for detecting a location of a second portion of the player, which is different from the first portion; and
- game progress means for proceeding with a game by
- 5 determining a command the player wants to input on the basis of a relative position of the second portion with respect to the first portion, which are detected by said first and second sensors, and executing the determined command.
- 10 31. The apparatus according to claim 30, wherein said first and second sensors respectively detect locations/postures of the first and second portions.
32. The apparatus according to claim 30, wherein the first portion is a head of the player, and the second
- 15 portion is a hand of the player.
33. The apparatus according to claim 30, further comprising means for detecting information which pertains to a state change of the second portion with respect to the location or a location/posture of the
- 20 first portion, and information which pertains to a location change velocity of the state change, and wherein the command is generated in further consideration of the detected velocity.
34. The apparatus according to claim 30, further
- 25 comprising means for detecting information which pertains to a state change of the second portion with

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- respect to the location or a location/posture of the  
first portion, and information which pertains to a  
location change acceleration of the state change, and  
wherein the command is generated in further  
5 consideration of the detected acceleration.
35. The apparatus according to claim 30, further  
comprising means for detecting a posture of the second  
portion with respect to a posture of the first portion,  
and  
10 wherein the command is generated in further  
consideration of the detected posture of the second  
portion.
36. The apparatus according to claim 30, further  
comprising means for detecting a moving direction of  
15 the location of the second portion with respect to a  
posture of the first portion, and wherein the command  
is generated in further consideration of the detected  
moving direction of the location of the second portion.
37. The apparatus according to claim 30, further  
20 comprising a memory for storing a value of the relative  
position of the second portion with respect to the  
first portion, and a plurality of player commands which  
are defined in advance as a result of transition of the  
value.
- 25 38. The apparatus according to claim 30, wherein said  
game progress means decomposes the determined player

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command into a plurality of operands, and executes the command in accordance with the plurality of decomposed operands.

39. The apparatus according to claim 33, wherein when  
5 a relative relationship between a location/posture of a head detected by said first sensor, and a location/posture of a hand detected by said second sensor indicates that a line of sight of the player is pointing to a predetermined portion of the hand,  
10 said game progress means generates a player command for outputting an operation guidance.

40. The apparatus according to claim 30, further comprising a third sensor for detecting a bent angle of a finger.

15 41. The apparatus according to claim 1, wherein the action information further includes geometric information of the first and second portions in a reference coordinate system.

20 42. The apparatus according to claim 14, wherein said estimation means extracts geometric information of the first and second portions in a reference coordinate system, and estimates a player action on the basis of the geometric information.

25 43. The method according to claim 18, wherein the detection step includes the step of extracting

geometric information of the first and second portions in a reference coordinate system.

44. The apparatus according to claim 30, wherein said game progress means further extracts geometric  
5 information of the first and second portions in a reference coordinate system, estimates an action of the player on the basis of the geometric information, and determines the command the player wants to input on the basis of the estimated action.

10 45. An interface apparatus comprising:

a first sensor for detecting a location or motion of a first portion of a body of a user;

a second sensor for detecting a location or motion of a second portion of the user, which is  
15 different from the first portion;

determination means for analyzing outputs from said first and second sensors and determining a command input by the user on the basis of patterns of the outputs from said first and second sensors; and

20 output means for outputting the command determined by said determination means to an object to be controlled.

46. The apparatus according to claim 45, wherein the first portion is a head, and the second portion is a  
25 hand.

47. The apparatus according to claim 45, wherein said first and second sensors respectively detect locations and postures of the first and second portions.
48. The apparatus according to claim 47, wherein said 5 first and second sensors respectively detect location change velocities, location change accelerations, and moving directions of the first and second portions.
49. The apparatus according to claim 48, wherein said determination means analyzes an action of the user 10 using information of a change in location, the location change velocity, location change acceleration, and relative moving direction of the second portion with respect to the first portion, and specifies a command corresponding to the action.
- 15 50. The apparatus according to claim 49, wherein said determination means has storage information which defines in advance a relationship between the action of the user and the corresponding command.
51. The apparatus according to claim 50, wherein the 20 command output from said determination means is supplied to the object to be controlled, and an image corresponding to the command is displayed.
52. A user interface method comprising:  
the first detection step of detecting a location 25 or motion of a first portion of a body of a user;

the second detection step of detecting a location or motion of a second portion of the user, which is different from the first portion;

the determination step of analyzing outputs of  
5 the first and second detection steps and determining a  
command input by the user on the basis of patterns of  
the outputs of the first and second detection steps;  
and

the output step of outputting the command  
10 determined in the determination step to an object to be controlled.

53. The method according to claim 52, wherein the first portion is a head, and the second portion is a hand.

15 54. The method according to claim 52, wherein the  
first and second detection steps include the steps of  
respectively detecting locations and postures of the  
first and second portions.

55. The method according to claim 54, wherein the  
first and second detection steps include the steps of  
respectively detecting location change velocities,  
location change accelerations, and moving directions of  
the first and second portions.

56. The method according to claim 55, wherein the  
determination step includes the step of analyzing an  
action of the user using information of a change in

location, the location change velocity, location change acceleration, and relative moving direction of the second portion with respect to the first portion, and specifying a command corresponding to the action.

- 5 57. The method according to claim 56, wherein the determination step includes the step of determining the command on the basis of storage information which defines in advance a relationship between the action of the user and the corresponding command.
- 10 58. The method according to claim 57, wherein the object to be controlled displays an image corresponding to the command.